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ON THE MALE GENITALIA OF THE LARGER HESPERIIDAE OF NORTH AMERICA

BY HENRY SKINNER AND R. C. WILLIAMS, JR.

It is now generally conceded that in some of the groups of butterflies the male genitalia offer characters of very great importance in classification. This was recognized as applying particularly to the HesperIIDae by Godman and Salvin, who, in the *Biologia Centrali-Americana*, give many excellent figures of the Central American species, including many of those which find their way into our fauna across the Mexican border. It is our object in this paper to present figures of all the larger North American species of which we have available material.

The *Biologia*, an unusually carefully prepared and scientifically correct publication is, however, not available to the average student as the parts were not sold separately, and the three volumes dealing with the Rhopalocera are now quoted separately at a very high price. For this reason, and because the details of the aedoeagus were omitted, we are again figuring the *Biologia* species, although the correctness and excellence of these figures commands our highest praise.

Dyar in 1905¹ reviewed the HesperIIDae, generally adopting Scudder's classification; Skinner in 1911² contributed to our knowledge of our larger species, and Lindsey's valuable paper of 1921³ is the basis for our work, which covers the single species in the sub-family Pyrrhopyginae and Group A of Dyar and Lindsey in the HesperIIDae.

Scudder in his "Butterflies of Eastern United States and Canada" has figured in volume III, plate 35, the male genitalia of five of the species of this group coming within the territory covered by him.

The genitalia were prepared by separating the tegumen, valvae and aedoeagus, and mounting them separately on slides;

¹ Jour. N. Y. Ent. Soc., XIII, p. 111, 1905.

² Trans. Am. Ent. Soc., XXXVII, p. 169.

³ Univ. of Iowa, Studies Nat. Hist., IX, no. 4.

sketches were made directly from these as they lay under the cover glass. There is distortion of course, but, as the general shape and the relationship of the parts in life is well known, we believe this to be the best method for this group. Only the chitinous parts were outlined and hairs and other vestiture are omitted.

In regard to the classification followed, we are frankly opposed to the splitting up of the older blanket genera, believing that substantial scientific characters only should be used in such separations, and that the utilitarian value of the generic name should not be lost sight of. We have followed Lindsey in many of his conclusions, but prefer to retain for the present the older conception of the genus *Eudamus*, and unite *Achalarus*, *Thorybes*, *Cogia* and *Phoedinus* under the oldest name, *Cogia*, for while in some instances the genitalic characters in the species tend to confirm his conclusions, in other cases the reverse is true, and we are of the opinion that male secondary characters, such as the costal fold and wing and tibial tufts, have specific value only.

We have thirty-seven species attributed to our fauna, of which three are doubtful and eight are Central American species with a single record of capture over the border.

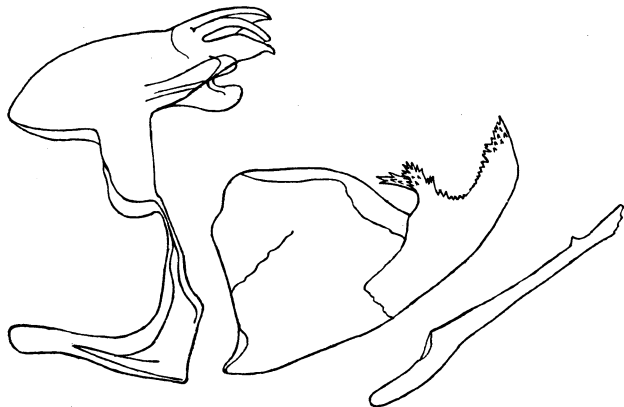


Fig. 1. *Apyrrothrix araxes arizonae*. Mount Graham, Arizona.

PYRRHOPYGINAE

1. *Apyrrothrix araxes arizonae* Godman and Salvin (Fig. 1.)

The genus has been erected by Lindsey for this species. The male genitalia of the typical Mexican form figured in the *Biologia*⁴ is practically the same as that of the Arizona race. There is a tooth towards the extremity of the aedoeagus. The third central projection in the uncus, present in the allied genera, more or less developed, is typical of this group.

HESPERIINAE

2. *Phocides batabano* Lucas (Fig. 2.)

The third long central projection in the uncus with its curious beaked terminus is typical of this genus, and the scaphium is absent as in most of the other species. The aedoeagus is provided internally with a number of candle-shaped teeth and the external end is shagreened.

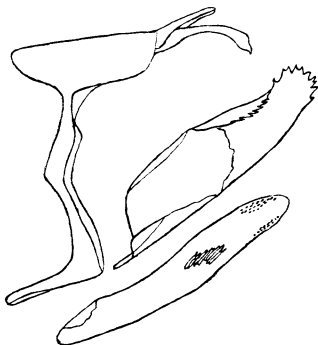


Fig. 2.

Fig. 2. *Phocides batabano*. Cuba.

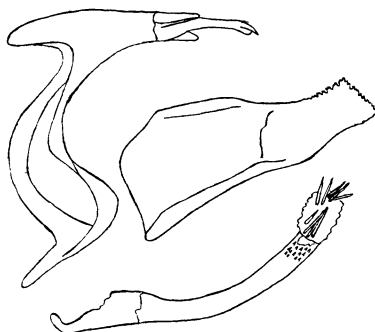


Fig. 3.

Fig. 3. *Phocides lilea*. Honduras.

3. *Phocides lilea* Reakirt (Fig. 3.)

Biologia, pl. 76, fig. 24.

There is a specimen in the Academy collection, agreeing with the figure in the *Biologia*, which came to Dr. Skinner from Dr. Scudder, bearing the label "Type *sanguinea*, Texas, Pope Exp." Scudder had this insect before him when he described the

⁴ Plate 73, fig. 16.

species under the latter name in "A systematic review" etc., published in the Fourth Annual Report of the Trustees of the Peabody Academy of Science for the year 1871, printed in Salem, Massachusetts, 1872, pages 24 to 83; and we select this specimen, a male, as the type of *sanguinea* Scudder, falling to *lilea* Reakirt. We have the species from Alahuella, Costa Rica, (Harrower).

4. **Phocides urania** Westwood-Hewitson.

There is a male specimen in the Academy Collection labelled by Scudder "*Texana* Type." It agrees with the *Biologia* figure of *urania*, but does not agree with his description of *texana* in the paper referred to above, which may, however, have been based on a worn female. As both (*urania* and *texana*) are recorded as obtained from the Pope Texas Boundary Expedition, they may have been caught in the same locality and not recognized by Scudder as male and female of the same species, until after the description of the *texana* had been published.

5. **Nascus hesus** Westwood-Hewitson (Fig. 4.)

This is another species included in our fauna through Scudder's record "Texas, Pope, Mexican Boundary Survey" in the same publication. Of course all of these records are doubtful, as the survey covered both sides of the Rio Grande, and it is probable

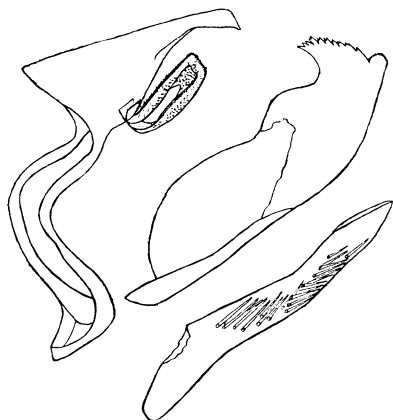


Fig. 4.

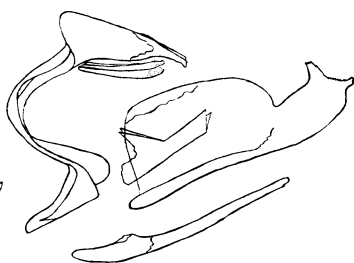


Fig. 5.

Fig. 4. *Nascus hesus*. Fig. 5. *Polygonus amyntas arizonensis*. Florence, Arizona.

that the insects collected were brought in by interested natives and may have come from some distance. None of the three have been captured north of the river since the date of their description (1871).

The females in this group are remarkably dissimilar from the males. *Euribates* Cramer is a female, and Skinner followed Godman and Salvin, who in the *Biologia*, sunk the name *hesus* under *euribates*. However, it is perhaps best to use the former name until the two sexes are definitely proved to be those of the same species. The male genitalia show a single shagreened scaphium, and the aedoeagus includes numerous floating spines.

6. ***Polygonus amyntas arizonensis*** Skinner (Fig. 5.)

Typical *amyntas*, *Biologia*, pl. 77, fig. 9.

There is no difference in the male genitalia between the typical Florida and Arizona forms.

The uncus terminals are bifid, two long arms of scaphium shagreened at terminus, aedoeagus slender and naked and this species has a well developed juxta which may act as a support for the last.

The type and paratypes of *arizonensis* are in the Academy Collection, (Florence, Arizona; Biederman).

7. ***Proteides idas*** Cramer (Fig. 6.)

Biologia, plate 77, fig. 5.

The scaphium is somewhat shagreened above and the aedoeagus contains two short candle-shaped spines.



Fig. 6.



Fig. 7.

Fig. 6. *Proteides idas*. Yucatan. Fig. 7. *Epargyreus zestos*. Key West, Florida.

8. **Epargyreus zestos** Geyer (Fig. 7.)

In addition to Miami and Key West examples in the Academy Collection, there are some from the Bahamas.

In this and the following species of this genus, the aedoeagus is ragged and dentate at its terminus and slightly shagreened.

The conspicuous central costal projection on the valves bearing rather long stout spines readily separates the species of this genus from those of *Proteides*.

9. **Epargyreus tityrus** Fabricius (Fig. 8.)

The male genitalia are very close to those of the preceding and following species which, however, are readily separated by their color and maculation.

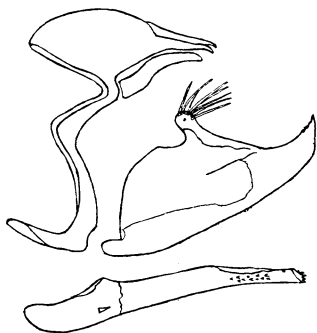


Fig. 8.

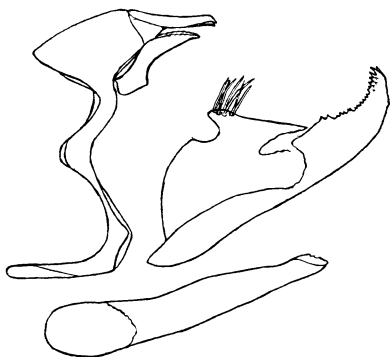


Fig. 9.

Fig. 8. *Epargyreus tityrus*. Cloudercroft, New Mexico. Fig. 9. *Epargyreus exadeus*. Chapada, Brazil.

10. **Epargyreus exadeus** Cramer (Fig. 9.)

Biologia, Plate 75, fig. 5.

We have specimens from San Luis Obispo, California, March.

11. **Eudamus (Goniurus) proteus** Linnaeus (Fig. 10.)

Biologia, plate 75, fig. 5.

Scudder, fig. 37.

The genus *Eudamus* was erected by Swainson in 1832 with *proteus* as type. *Goniurus* was erected by Hubner in 1820 for *simplicius*, *coelus*, *proteus* and six other species. Watson in 1893 selected *coelus* Cramer (*aurunce* Hewitson) as type of

Goniurus, and is followed by Godman and Salvin in the *Biologia*, who place with it *talus*, a similar untailed hesperid, but with the generic distinction from *Eudamus* open to question. Lindsey puts *simplicius* as the type of *Goniurus*, presumably as the first mentioned species. Now if *coelus* is declared congeneric with the tailed hesperids now usually included under *Eudamus*, the latter name must fall for the former, but if the contrary obtains, *Goniurus* should be confined to *coelus* and *talus*, neither coming in our fauna, and *Eudamus* still holds for the considerable group of tailed skippers headed by *proteus*; the writers are inclined to follow this course.

The male genitalia with its cleft uncus, conspicuous but simple scaphium and rather normal clasp, may be called typical of this entire group of the HesperIIDae. The aedoeagus contains a stout, many-branched spine.

A very closely related species, *esmeraldus*, very difficult to distinguish from its color and maculation, has a very different terminus to its valve.

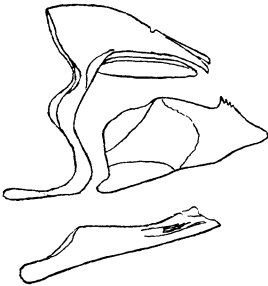


Fig. 10.



Fig. 11.

Fig. 10. *Eudamus* (*Goniurus*) *proteus*. Miami, Florida. Fig. 11. *Eudamus* (*Goniurus*) *dorantes*. Gatun, Canal Zone, Panama.

12. ***Eudamus* (*Goniurus*) *dorantes* *rauterbergi* Skinner** (Fig. 11.)

Typical *dorantes* *Biologia*, plate 75, fig. 7.

This species has a wide range to the south from our border, and is subject to considerable variation in series from any locality. *Rauterbergi*, the type of which is in the Academy

Collection, represents the small dark form *santiago*, from Cuba, and a similar form, though still darker, from Porto Rico (Williams) are the insular representatives of *dorantes*.

The tegumen is typical, valve with flat toothed extremity cleft deeply on costal extremity and the aedoeagus carries a long, stout, curved spine.

13. **Eudamus simplicius** Stoll (Fig. 12.)

Biologia, plate 75, fig. 1.

We have this species from Guatemala (Rhoads); Canal Zone, Panama (Harrower); Vera Cruz, Mexico (Williams), and Texas (Aaron).

The male genitalia of this and the following species are almost identical. The aedoeagus carries a long slender spine, and the tip of the valve is rounded with a projecting tooth curiously like a bird's head and beak.

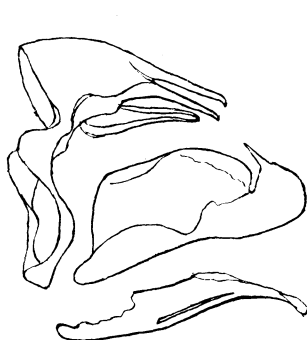


Fig. 12.

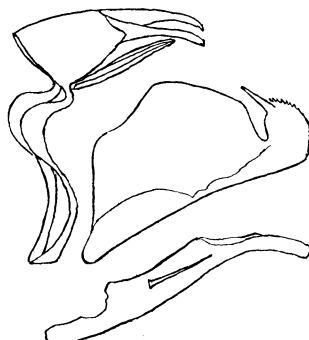


Fig. 13.

Fig. 12. *Eudamus simplicius*. Puerto Barrios, Guatemala. Fig. 13. *Eudamus eurycles*. Puerto Barrios, Guatemala.

14. **Eudamus eurycles** Latreille (Fig. 13.)

This species is without the costal fold present in the male of that above, and the hyaline band is conspicuous. We have it from Guatemala (Rhoads); Bocas del Toro, Panama (Williams) and other Central American localities, including Colima, Mexico. Skinner's record is undoubtedly correct, as most of the species recorded in the list in 1901 have since been confirmed by subsequent captures.

15. **Eudamus (Chioides) albofasciatus** Hewitson (Fig. 14.)

Biologia, plate 75, fig. 11.

Lindsey places this and the following species in a genus he erects for them, based on characters which may or may not be of sufficient importance to warrant this action. We are inclined to deplore the splitting up of the older genera in general, and as we do not find important characters in the male genitalia to support this separation, prefer to retain these species in the genus *Eudamus*.

In this and the following, the scaphium is shagreened, aedoeagus simple and the principal differences are confined to the shape of the valve, especially its terminal structure, these having strong specific but little generic value.

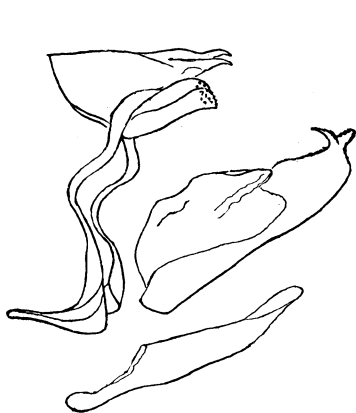


Fig. 14.

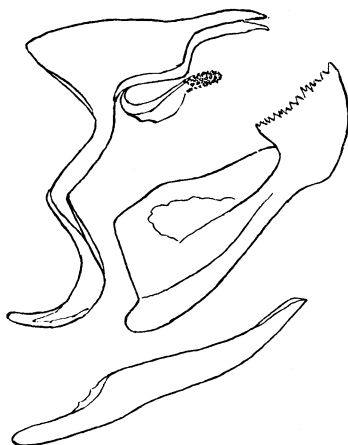


Fig. 15.

Fig. 14. *Eudamus (Chioides) albofasciatus*. Vera Cruz, Mexico. Fig. 15. *Eudamus (Chioides) zilpa*. Unknown locality.

16. **Eudamus (Chioides) zilpa** Butler (Fig. 15.)

Biologia, plate 75, fig. 8.

A striking species, the under side of the male being well figured in Lindsey's paper.

17. **Eudamus alcaeus** Hewitson (Fig. 16.)

Biologia, plate 75, fig. 12.

We have specimens from Huigra, Ecuador (Rhoads), and Williams has caught it in Vera Cruz, Mexico. It is another species entering our fauna through the Runyeon capture, which is authentic.

The male genitalia show a highly developed shagreened scaphium, the cleft uncus terminals show a tendency only to the short and spatulate condition obtaining in the following species (*melon*), and the aedoeagus carries a branched spine similar to that of *proteus*. We prefer to leave this species in *Eudamus*.

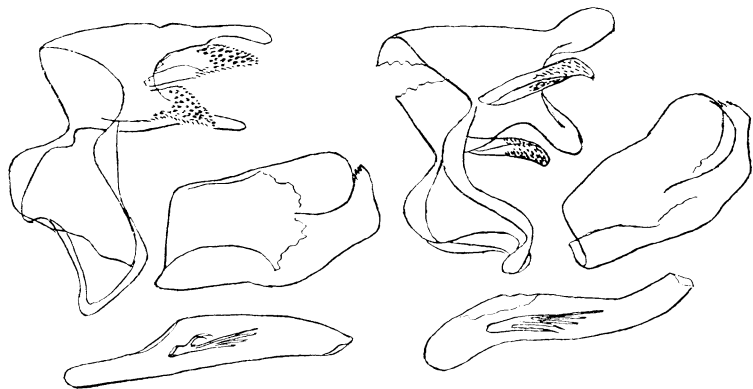


Fig. 16.

Fig. 17.

Fig. 16. *Eudamus alcaeus*. Huigra, Ecuador. Fig. 17. *Codatractus melon arizonensis*. Baboquivari Mountains, Arizona.

18. **Codatractus melon arizonensis** Skinner (Fig. 17.)

The type and paratypes of the Arizona form (Poling) are in the Academy Collection.

The male genitalia show, as indicated above, comparatively short, widely separated spatulate terminal projections to the uncus. The aedoeagus carries a branched spine, which has the forks leaving the stalk rather lateral than distal.

19. *Telegonus hahneli* Staudinger

This is another species recorded in our fauna through the Runyeon catch. The identification was made from the Godman and Salvin figure in the *Biologia*, which differs from the Staudinger figure in the absence of the yellowish outer border of the wings, and the shape of the secondaries, which are rounded in the former and with a projecting anal angle in the latter.

The type of *hahneli* is from Merida, Venezuela, but Staudinger mentions, in the description, having specimens from Chiriqui, Panama. It is possible that two species are involved, and that Godman and Salvin had before them a Chiriqui specimen instead of the Venezuela type, and so identified it with their own Chiriqui and Costa Rican material.

We have specimens from Jamaica and the Island of St. Thomas.



Fig. 18.

Fig. 19.

Fig. 20.

Fig. 18. *Plestia dorus*. Jemez Hot Springs, New Mexico. Fig. 19. *Cecropterus cellus*. Mount Graham, Arizona. Fig. 20. *Cecropterus pseudocellus*. Ramsay Canyon, Huachuca Mountains, Arizona.

20. *Plestia dorus* Edwards (Fig. 18.)

There is a specimen in the Academy Collection from the type catch. *Dorus* has the normal cleft uncus projections and the aedoeagus contains a stout branched spine.

21. **Cecropterus cellus** Boisduval and Leconte (Fig. 19.)

Biologia, plate 89, fig. 8.

This species has a normal tegumen, but the general shape of the valvae is quite different in plan from that obtaining in the preceding and following genus. The aedoeagus is long and slender and carries a pair of slender connected spines.

22. **Cecropterus pseudocellus** Coolidge and Clemence (Fig. 20.)

There are cotypes in the Academy Collection, and a specimen from Real del Monte, Hidalgo, Mexico, April 13, 1908. These have the pale ring at the base of the antennal club mentioned by Lindsey.

23. **Cogia (Achalarus) lycidas** Abbott and Smith (Fig. 21.)

Scudder, fig. 44.

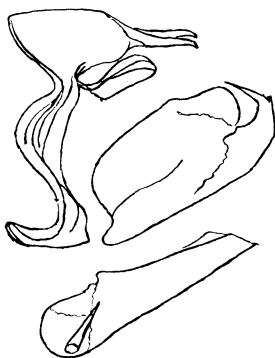


Fig. 21.

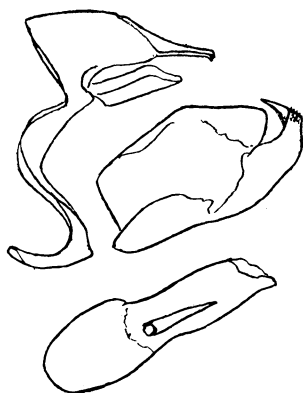


Fig. 22.

Fig. 21. *Cogia (Achalarus) lycidas*. Unknown locality. Fig. 22. *Cogia (Achalarus) epigona*. Arizona.

24. **Cogia (Achalarus) epigona** Herrich-Schaeffer (Fig. 22.)

Biologia, plate 80, fig. 11.

The male genitalia of these two species are almost identical.

25. *Cogia (Achalarus) albociliata* Mabille (Fig. 23.)

Biclogia, plate 80, fig. 14.

We have specimens of this from Alta Mira, Mexico, August 14, and San Pedro Sula, Honduras, January 5, 1922, (Lienhart), which agree with the Godman and Salvin figures. The male genitalia are very similar to those of the two species above, even in the shape of the valve terminus, though in this character it differs remarkably from the following species, with which it has been associated since 1905. It is doubtful if this species enters our fauna, as the records probably apply to the following species.

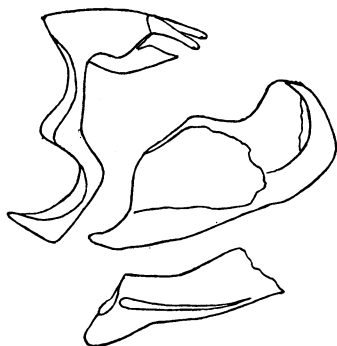


Fig. 23.

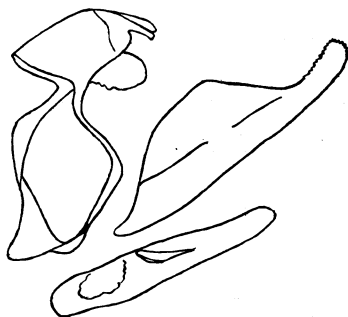


Fig. 24.

Fig. 23. *Cogia (Achalarus) albociliata*. San Pedro Sula, Honduras. Fig. 24. *Cogia coyote*. Corpus Christi, Texas.

26. *Cogia coyote* Skinner (Fig. 24.)

This species, described from southern Texas near Corpus Christi, (Aaron), is represented in the Academy Collection by the types and a paratype from which the genitalia is figured.

In appearance they differ from *albociliata* in slightly smaller size, much lighter color, *coyote* being brown and *albociliata* almost black above, the fringe is not so white, the markings on the secondaries below in *coyote* are of a darker brown than the ground color, while in *albociliata* they are somewhat lighter than the ground color, but outlined in a darker shade.

The male genitalia differ from those of the previous species in the very much shorter terminals to the uncus, as well as the very remarkable difference in the valves.

The records of *albociliata* by Dyar from the Patagonia Mts., Arizona, (Oslar), and Kerrville, Texas, and Leussler's Beeville, Texas, October 16, 1916, (Patty Hutchinson), probably apply to this species.

27. ***Cogia (Thorybes) drusus*** Edwards

The two specimens in the Academy Collection are from the type catch. The Lindsey record "Western Nebraska" is an error, as Mr. Leussler has had nothing like it from that locality.

28. ***Cogia (Thorybes) pylades*** Scudder (Fig. 25.)

Biologia, plate 80, fig. 23.

Scudder, fig. 35.

The type of the aberration *immaculata* Skinner is in the Academy Collection.

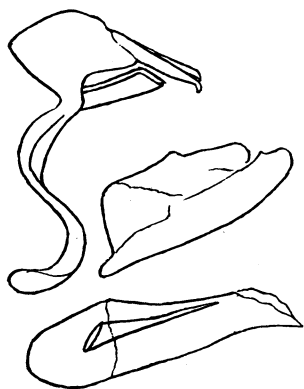


Fig. 25.

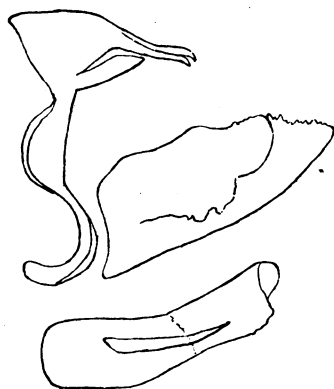


Fig. 26.

Fig. 25. *Cogia (Thorybes) pylades*. Avon, Connecticut. Fig. 26. *Cogia (Thorybes) bathyllus*. Philadelphia, Penna.

29. ***Cogia (Thorybes) bathyllus*** Abbott and Smith (Fig. 26.)

Scudder, fig. 38.

Lindsey in using the name *daunus* Cramer follows Dyar, who in turn perhaps follows a reference in Godart, *Encyclopedie*

Méthodique.⁵ Godart says *bathyllus* approaches *daunus* in appearance. From the Cramer figure of *daunus* it is doubtfully possible to identify the species, which may be an unidentified Surinam insect. *Bathyllus* appears to be confined to America north of Mexico, as it has not been recorded in the Biologia.

The figure of *bathyllus* in Abbott and Smith's Insects of Georgia is excellent, and it seems unwise to place it as a synonym of *daunus* without additional evidence.



Fig. 27.

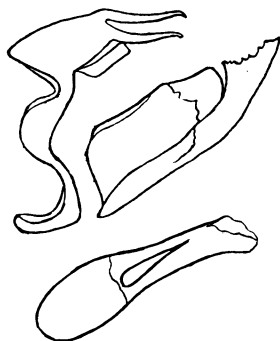


Fig. 28.

Fig. 27. *Cogia (Thorybes) mexicana*. Uruapan, Michoacan, Mexico. Fig. 28. *Cogia (Thorybes) nevada*. Mono Lake, California.

30. ***Cogia (Thorybes) mexicana*** Herrich-Schaeffer (Fig. 27.)

Biologia, plate 80, fig. 17.

We have this species from Uruapan, Mexico, April 15, 1919; Popocatepetl Park, Mexico, September 17, 1906 (Calvert), and Real del Monte, Hidalgo, Mexico, August 40, 1908 (Van Nostrand). We believe that the male genitalia, however, warrant its separation from *nevada* Scudder (*aemelia* Skinner). The tegumen and aedeagus are alike, but the extremity of the valve in *mexicana* is somewhat convex and slightly serrate, while that of *nevada* is concave or well cut into with a rounded excavation, and the serrations or teeth are much stronger. *Mexicana* probably does not enter our territory.

⁵ x, p. 764, 1823.

31. **Cogia (Thorybes) nevada** Scudder (Fig. 28.)

The types of *aemelia* are in the Academy Collection. We have typical *nevada* from Fort Klamath, Oregon, June 6 to 18; Lundy, California, July 9 (Wickham); Deer Park, Placer Co., California, July 11, 1908; Cloudcroft, New Mexico, May 7 to 26 and July 27 (some dark individuals); Jemez Springs, New Mexico, July 21 (Woodgate), and Colorado.

A darker form, in which also the hyaline spots are not so large, we have from Mt. Graham, Arizona (Morrison); Park City, Utah, July 6, 1895, and Silver Lake, Utah, July 13 (Skinner). This is the form that has been considered *mexicana* in collections. We have intermediate forms from City Creek Canyon, Utah, July 17, 1898, and Sierra la Sal Mts., Utah, July 25, 1920 (Skinner).

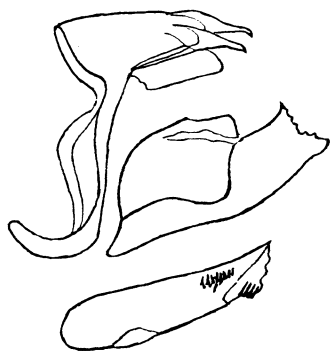


Fig. 29.



Fig. 30.

Fig. 29. *Cogia (Thorybes)* species. Summerville, South Carolina. Fig. 30. *Cogia calchas*. Texola, Vera Cruz, Mexico.

32. **Cogia (Thorybes) species** (Fig. 29.)

This species will be described by Mr. E. L. Bell on a subsequent page of this volume of the TRANSACTIONS.

The present species is in the Academy Collection from Tampa, Florida, March 19, (Bell); Wilmington, North Carolina, April 25; Tallulah Falls, Georgia, July 7; Summerville, South Carolina (Jones), and Round Mountain, Blanco County, Texas, determined genitally.

While the general appearance of this insect has lead to its confusion with *pylades* in collections, in addition to the absence of

the costal fold, the male genitalia are quite different from both *pylades* and *bathyllus* in the shape of the valve, and the fact that the aedoeagus is as in the subgenus *Phoedinus*, instead of a single thorn present, as in the balance of the species of the *Thorybes* group which we have examined.

It does, however, agree with the others of the *Thorybes* group in that the terminus of the uncus is bifurcate.

33. ***Cogia calchas*** Herrich-Schaeffer (Fig. 30.)

Biologia, plate 81, fig. 6.

This species has an extended range from Texas into South America. We have it from Brazil, Mexico, Colombia and Colon, Panama, February 19, 1912, (Williams).

The aedoeagus of this and the two following species encloses numerous short spines.

34. ***Cogia outis*** Skinner (Fig. 31.)

The types from Texas are in the Academy Collection. The terminus of the uncus of this species, the two following and *caicus* is not split, but on the contrary there is a similar single beaked terminus as though the double ends were fused together.

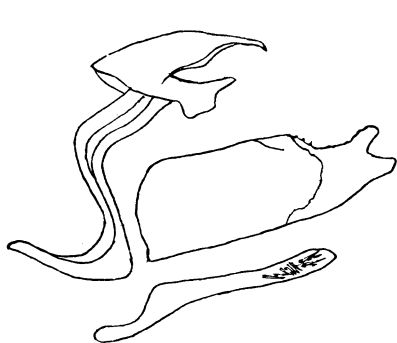


Fig. 31.

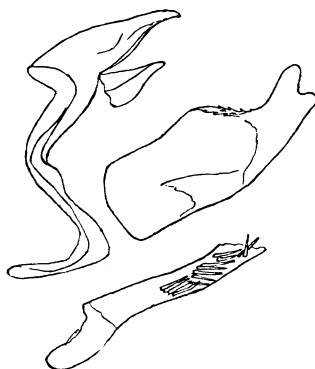


Fig. 32.

Fig. 31. *Cogia outis*. Round Mountain, Texas. Fig. 32. *Cogia hippalus*. Baboquivari Mountains, Arizona.

35. **Cogia hippalus** Edwards (Fig. 32.)

Biologia, plate 80, fig. 31.

There are specimens from the type locality—Arizona (Morrison, 1882)—probably of the type catch, and from Colima, Mexico.

The male genitalia of this and the above species are very close.

36. **Cogia (Phoedinus) mysie** Dyar

This species is not represented in the Academy Collection and we are not familiar with it.

37. **Cogia (Phoedinus) caicus** Herrich-Schaeffer (Fig. 33.)

Biologia, plate 80, fig. 20.

There is a series in the Academy Collection from Arizona (Morrison), the locality from which Edwards received the material upon which his *moschus* was described.

The general appearance and maculation of this species is very similar to that of the species of the *Thorybes* group, and the male genitalia are very close in their characters to those of the group above.



Fig. 33.

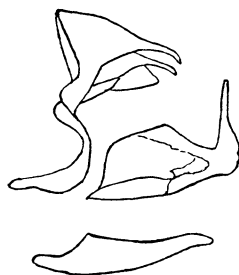


Fig. 34.

Fig. 33. *Cogia (Phoedinus) caicus*. Mount Graham, Arizona. Fig. 34. *Cabares potrillo*. Jamaica.

38. **Cabares potrillo** Lucas (Fig. 34.)

Biologia, plate 80, fig. 26.

There are examples in the Academy Collection from Mexico, Cuba, Haiti, San Domingo, Jamaica and Tortuga. The shape of the secondaries, as well as of the male genitalia with its peculiar valve and nude aedoeagus, seems to well separate it from the previous group.

The terminus of the uncus is strongly bifurcate, the aedoeagus is simple without spines or other attachments, and the valve terminates in a long spine somewhat serrate externally, and which in nature is bent back towards the base.